

Attachment 8: Quality Assurance

Attachment 8 demonstrates that the Upper San Gabriel Valley Municipal District (Upper District) has an appropriate and well-defined Quality Assurance and Quality Control (QA/QC) plan. This attachment describes the QA/QC plan and the measures that will be used in each task.

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DMS Quality Assurance

Appropriate and well-defined Quality Assurance and Quality Control (QA/QC) measures are designed for all tasks described in the Work Plan, such as:

- All geologic interpretation and digitization of the well construction will be performed under the supervision of a registered California registered Professional Geologist (PG). QA/QC protocols for well construction data acquisition, interpretation, and entry include:
 - Logs will be reviewed by the PG.
 - Since the DMS has a cross-section development toolbox, which develops geologic cross-sections from a set of digitized well logs, the lithologic data developed will be entered into the database, and an appropriate level of cross-sections will be developed to ensure quality and consistency of the work products.
 - The cross-sections will be checked for accuracy by PG to ensure quality of the well log interpretations.
 - Appropriate corrections will be made, if any errors and mistakes are encountered
- QA/QC protocols for groundwater quality data acquisition, interpretation, and entry include:
 - Searches for outliers based on map-based, graphical-based, and list-based processes. Outliers will be compared with source data for accuracy.
 - Automated or semi-automated quality control checks and validation.
 - Hard copy data entry will be double-entered and compared to ensure quality.
- QA/QC protocols for groundwater level data acquisition, interpretation, and entry include:
 - Searches for outliers based on map-based, graphical-based, and list-based processes. Outliers will be compared with source data for accuracy.
 - Map based verification of data through examination of outliers in contoured data
 - Automated or semi-automated quality control checks and validation.
 - Duplicate data will be compared and reconciled as appropriate
 - Hard copy data entry will be double-entered and compared to ensure quality.

IGSM Quality Assurance

The Quality Assurance and Quality Control (QA/QC) plan for development of the integrated groundwater and surface water model for the Upper San Gabriel Area is a comprehensive plan and the QA/QC measures include the following:

- **Personnel Qualifications** – The proposed team for development of the hydrological model includes registered professional engineers (PEs) with significant modeling experience. The modeling team has developed numerous hydrological models for basins throughout California.
- **Standardized Methodologies** – Standard methodologies such as the following ASTM standards will be used to develop the hydrologic model:
 - **ASTM D5447** – Application of a groundwater flow model to a site-specific problem:
 - Define study objectives,
 - Develop a conceptual model (a water budget in this case),
 - Construct a groundwater-flow model,
 - Calibrate model and perform sensitivity analysis,
 - Make predictive simulations,
 - Document modeling study.
 - **ASTM D5490** – Comparing groundwater flow model simulations to site specific information :
 - Quantitative techniques for comparing the simulation with site specific information (calculation of residuals between simulated and measured potentiometric heads, detection of correlations among residual, calculation of flow related residual),
 - Quantitative techniques for comparing the simulation with site specific information (comparison of general flow features, assessment of the number of distinct hydrologic conditions to which the model has been successfully calibrated, assessment of reasonableness or justifiability of input aquifer hydrologic properties)
 - **ASTM D5981** – Calibrating a groundwater flow application.
 - Establishing calibration targets,
 - Identifying calibration parameters
 - History matching accomplished by using trial-and-error method to achieve rough correspondence between simulation and physical hydrogeologic system, and then using either the trial-and-error or an automated method to achieve a closer correspondence).
 - Construct
 - **ASTMs 5611, 5718, 5609, and 5610**
- **Procedural Assurances** – Development of the integrated hydrological model will be reviewed by a technical committee consisting of members familiar with the data and hydrologic conditions of the basin. Additionally, the draft project reports will be made

available for technical committee members and DWR review before preparation of the final project reports.

- **Hydrologic Model** – The proposed integrated hydrological model has been developed by DWR. The model has a solid theoretical basis and has been reviewed previously
- **Comparison to Actual Data** – The proposed integrated hydrological model will be compared to actual data to enhance accuracy of the modeling results. Comparison and calibration of the model with actual data will include data with adequate temporal and spatial distribution. The actual data will include historical data for the past 20-30 years that is representative of dry year, wet year, multiple dry years, and multiple wet years hydrological conditions. Additionally, representative data points from various parts of the basin will be selected to provide adequate representation of spatial variation in hydrological conditions of the basin.